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Prof. Bell's Experiments With Tetrahedral Units.

EXPLANATORY ADDRESS

NOT A FLYING MACHINE, BUT PRELIMINARY THERETO.

Test of Principle in Overcoming Gravity—Exhibition Before National Geographic Society.

The members of the National Geographic Society were the guests of Prof. Alexander Graham Bell Saturday afternoon, on the occasion of the annual field day of the society, and on the farm used by the weather bureau for kite experiments, at Columbia, Va., the host treated his guests to a practical demonstration of the use of tetrahedral units in the construction of kites. For several years past Prof. Bell has been experimenting with the tetrahedral principle with a view of testing its utility in aerial navigation.

Prof. Bell has not constructed a flying machine. He desires that this shall be fully understood. His experiments as yet have not passed the kite stage. But he believes that when the problem of overcoming gravity is solved the tetrahedral principle of construction will be found to have advantages over the ordinary flat-surface aeroplanes, in the matter of weight and cost.

A tetrahedron, according to the Standard dictionary, is a solid bounded by four plane triangular faces and having therefore six edges and four vertices. To make a tetrahedron, or rather to get an idea of what a tetrahedron looks like, take three toothpicks and form a triangle with them, bind the ends together with sewing cotton, then take three more toothpicks and place one end of each in the corners of the triangle previously formed.

Bring the other ends of these three toothpicks together and bind them, and then bind the other ends to the corners in which they have been placed. There you will have a perfect tetrahedron on a small scale, and some idea of its strength can be obtained, for, even with toothpicks for sticks, it will be found that a very heavy pressure must be exerted on the corners to have an appreciable effect on the structure.

Test of Unit of Construction.

This is the unit of construction, which Prof. Bell invited the National Geographic Society to see tested in kite construction. The members of the society left the south side of the Aqueduct bridge in special cars at 2:30 o'clock and proceeded via the Washington, Arlington and Falls Church railroad, to Columbia, Va., the next station beyond Arlington. A short walk from the station brought the members to the weather bureau farm, which is under the direction of Mr. Henry C. Potter, for years in the employ of the weather bureau and signal corps as an experimenter in meteorological phenomena. On the brow of a hill overlooking Fort Myer and Arlington the kite experiments were conducted. The members of the society were addressed first by Mr. G. K. Gilbert, acting president of the organization, who told what had been done in kite flying. He said that it was only a few years ago that the kite was considered a useful toy for a boy, useful because it kept him quiet. Now the kite has passed to the man. It was only a few years ago that the weather bureau, through experiments with kites, gained valuable knowledge of air currents, etc., and now Prof. Bell is at work on a new theory of kite construction, which may be useful in other ways.

Prof. Bell Makes Statement.

Prof. Bell was then introduced. He said that he wished to disabuse the minds of any persons who came to see a man-carrying kite. He did not expect to show any such a structure. He has them, he explained, but they are safely housed in his laboratory a thousand miles away, and are so large that their transportation offered difficulties in the way of bringing them here, which he did not care to attempt to overcome at the present time. He then showed a small tetrahedron of the size of the units of the kites he intended to test. He explained what the tetrahedron is and then referred to its use in the possible solution of the problem of ariel navigation.

The value of such a unit, he said, lies in the fact that it is the only known unit of construction which offers a corresponding increase of lifting power with increase in weight. A flat surface or plain gives but one-fourth increase in lifting power to the increases in weight to begin with, and is inadequately braced. The tetrahedron is braced in every direction. There is no strain which can come to one portion which the others do not get by even distribution. A glance at the construction, as explained, will show what a simple thing this seems to be. It will also be seen that there cannot be a complete horizontal surface through any position of this unit.

Prof. Bell showed a single cell covered with red silk on two of its four surfaces. The sticks of which this cell was constructed were about one-sixteenth to one-thirty-second of an inch in thickness, and about ten inches long. They were bound together at the corners with cord. Any one of the sticks could be broken with a slight pressure at its center with the little finger. But it would require great pressure at any of the corners, where the stain comes, to of the corners, where the strain comes, to wood and aluminum were passed among those present for examination and test.

After explaining the value of the unit Dr. Bell told how these units could be hitched together in sets, and how the addition of each unit increased the lifting power of the whole in just the proportion of the increase of weight to the whole; that is, the addition of one cell gave the same addition in strength as it did in weight. Consequently dozens of these cells could be hitched together in various forms, and with the addition of each cell came an increase in the lifting power.

Dr. Bell then showed an aluminum frame for a sixteen cell kite. The frame was so light that it was easily handled, although its edges were three feet long, and was passed around among those in the crowd. The experimenter then showed his first kite. The first was covered with red silk and its frame work was of wood. It weighed 1,291 grams and had a surface of 3,464 square meters. The flying weight was 373 grams to the square meter. Prof. Bell handled the reel on which was wound the cord attached to the kite, and when the time came to run with the cord the professor was as spry and got over ground as quickly as though he didn't weight more than a boy.

The Wind Not Favorable.

The wind was not very brisk and the kites did not go as well as they would have on a windier day. The kite did go up in the air, however, and remained at an elevation of about 1,500 feet as long as the professor desired.

The second kite sent up was made of aluminum and its weight was 3 pounds 9 ounces, or 1,617 grams, with a surface of 2,484 square meters, the same as the other, but its flying weight was 467 grams per square meter. Some addition to the weight was also made by the steel wire with which this was flown, used in place of the linen cord attached to the lighter kite. The aluminum kite was sent into the air twice and attained good height both times. It was managed by Mr. Potter from a windlass, on which the wire with which it was flown was wound.

The last kite flown was of an entirely different shape from those previously shown. The tetrahedral unit was used in this kite, but instead of combining the units in the form of a tetrahedron, it was made of tetrahedral cells fastened together to form a horizontal plane. The cells were placed in two series and formed a kite about six feet long and fifteen inches wide, somewhat like the Hargreve kite in shape, although entirely different in construction. This kite was the only one flown which has a distinctive name. It is called “Baby O'Niel,” in honor of one of the workmen in Prof. Bell's laboratory at Cape Breton, N. S., who built it.

Prof. Bell said he did not know much about flying “Baby O'Niel,” but he would do the best he could. The kite mounted in the air in good style, but the wind died down while it was up and it came down. It had been the intention of the professor to show his “Victor” kite, which is a combination of several of the first style shown, but there was not enough wind.

Test of Supporting Ability.

After the exhibition of flying a test of the supporting ability of the tetrahedral principle was given. An aluminum kite frame was placed across two poles and a boy was placed on top of it. This was a frame of the size that had been flown. The weight of the boy had no effect on the frame whatever. Then a man, weighing 100 pounds, was permitted to swing on the frame by his hands. A careful examination of the frame failed to show the slightest change of position of any of the units of the structure.

At the conclusion of the test Prof. Bell announced that he has a motor which he proposes to test with his kites this summer, if possible, in order to arrive at some definite conclusions as to his ability to construct a flying machine which will be completely under control on the principle of the tetrahedral kite.

There were about 500 members of the National Geographic Society and their guests present. Among those who watched the experiments closely were Prof. Samuel P. Langley of the Smithsonian Institution, Prof. Charles M. Manley, Prof. Langley's chief assistant in the tests of the aerodrome last summer and fall, and the entire force of scientific men and mechanics from the Smithsonian Institution's houseboat.